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"Context-Graded Referential Logic"

A concise formal summary

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Context-Graded Referential Logic

Terms of Distribution:

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A concise formal summary

1. Basic Definitions

Primitive entities:

- W_0: current world (actual context).
- W': alternative world (possible but non-existent in W_0).
- $k \in [0,1]$: distortion degree (0 = truth in W', 1 — complete falsehood).

Operators:

- $True(\phi)$: ϕ is true in W_0.
- $Distort(\phi, k, W')$: ϕ is true in W' with distortion degree k.

2. Axioms

a). Graded Distortion:

In W_0 the statement $Distort(\phi, k, W')$ transforms into:

$$True_k(\phi) = \begin{cases} \phi, \quad if \quad k=0 \quad (truth \in W'), \\ \perp_0, \quad if \quad k=1 \quad (complete\, falsehood), \\ \sim\phi(1-k), \quad if \quad 0<k<1 \quad (graded\, uncertainty), \end{cases}$$

where:

$\perp_0$ — falsehood marker (analogous to $\varnothing$ but preserving the assertion's existence) enables the recording of false statements for analysis, allows safe execution of logical operations, and clearly separates intentional lies from technical errors (Error),

- Technically equivalent to 0 in Boolean algebra
- Distinct from classical $\perp$ (contradiction)
  - Properties:
    - $\perp_0 \wedge \phi = \perp_0$
    - $\perp_0 \vee \phi = \phi$
    - $\neg \perp_0 = True$

$\sim\phi(1-k)$ — a fuzzy/probabilistic form of ϕ with confidence degree $(1-k)$.

Example: $\sim\phi(0.3) = \text{Possibly}\, \phi(70\%\, confidence)$.

Formally: a modal operator with probabilistic evaluation.

b). Referential Collapse:

If W' does not exist, $Distort(\phi, k, W')$ transforms into $\perp_0$ (falsehood marker) when $k > 0$:

$Distort(\phi, k, W') \to \perp_0$.

At $k = 0$ (if ϕ should be true in non-existent W') — the statement also yields $\perp_0$, since reference to a non-existent context is invalid.

Impossibility Criterion for W':

- ϕ references itself,
- ϕ contains infinite evaluation recursion.

For self-referential statements (e.g., the Liar Paradox), W' is defined as non-existent (for any k).

3. Examples

$Distort('The\ cat\ is\ on\ the\ mat', 0.3, W') \to in\ W_0 : 'The\ cat\ is\ possibly\ (70\%\ confidence)\ on\ the\ mat'$

$Distort('I\ am\ lying', 0.5, W') \to in\ W_0 : \perp_0$

4. Advantages

- Paradox Resolution: Self-referential statements are marked as false, preserving the system's consistency.

- Graded Truthfulness: The parameter k explicitly quantifies distortion degree — from complete truth ($k = 0$) to absolute falsehood ($k = 1$).

- Model Flexibility: Requires no ad-hoc prohibitions or complex hierarchies, relying instead on intuitive notions of reference and context.

- Falsehood Tracking: The $\perp_0$ marker explicitly records false statements, enabling analysis of their sources and frequency patterns.

5. Conclusion

Context-Graded Referential Logic offers a balanced approach that combines the rigor of a formal system with the flexibility of the real world. Here, falsehood is not a destroyer of logic but its natural counterpart: it exists in alternative contexts (W') as a "shadow" of truth and is clearly marked by the system ($\perp_0$), even in paradoxical cases. The model maintains intuitive clarity while avoiding classical contradictions.